1917

The Mineral Industry -- 1892-1916

Gar A. Roush

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By G. A. Roush
Editor, The Mineral Industry

In glancing through the first volume of "The Mineral Industry" we find many statements and discussions that in the light of present day developments are very interesting and in some cases amusing, as no doubt many of the discussions of the present day will appear to the reader of a quarter of a century hence.*

For example, attention is called to the enormous developments that had been made in the five or six years preceding in the metallurgy of aluminium, emphasizing the fact that the price of the metal had been brought down to as low as 50 cts. per lb. and the production for the year, in the United States, was almost 300,000 lb., and the world's production almost 500 metric tons. The article closes with the statement, "It is doubtful if the further prosecution of the electrical methods, by which alone aluminium is now made, will bring the cost of it to the point at which it will become a prominent metal, unless they proceed along the line of direct reduction. Even here it is by no means certain that they can make it cheap enough. . . . While the electrical reduction methods are not to be condemned, those who seek by other means to make cheaper aluminium should be encouraged." Compare this with present conditions, with a United States production of 63,000 metric tons, a world's production of 132,500 tons and a production cost that has been estimated as low as 10 cts. per lb.

It is interesting to note that the coal production in the United States to-day is equal to the world's production as reported in 1892. The United States was then second in production with Great Britain leading, while the United States now leads with a production almost equal to the combined production of her two nearest competitors, Great Britain and Germany. These two for several years past have ranked very close together, with Great Britain slightly in the lead, while 25 years ago Great Britain's production was double that of Germany. Although these three great producers have changed order in the tables and have all seen enormous increases of production of from nearly 100 to over 300 per cent in the course of 25 years, the production of all three still bears almost exactly the same ratio to the world's production, namely, slightly over 80 per cent of the total.

During the period under review the world's copper production has more than trebled, while the production of the United States has increased to six times its former amount. The United States has always led in production, but during that time has increased from 45 per cent to almost 65 per cent of the total. Twenty-five years ago Spain and Portugal came second, Chile third, Japan fourth and Germany fifth; the order now stands Japan second, Chile third, Mexico fourth, Canada fifth.

With gold and silver the figures are no less interesting. The gold production of the world has quadrupled while that of the United States has trebled. Twenty-five years ago the order of production was United States, Australia, Russia, Africa. At present it is Africa, United States, Australia, Russia. The African production, due to the enormous developments on the Rand, has increased to over 14 times its previous value, and now leads with about double the production of the United States, its nearest competitor.

The silver, up to 1911, had increased about 60 per cent, but in the last five years there has been a rapid decline, due to the revolutionary activities in Mexico, the heaviest producer, so that at present the production stands only about 10 per cent higher than 25 years ago. Since the price has dropped faster than the production increased, the world's production of silver in 1915 was worth only about one-half as much as the production of 25 years ago. The rise of prices during the

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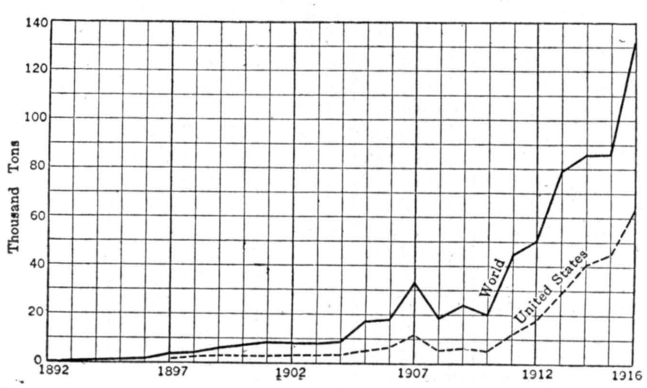

FIG. 1—ALUMINIUM PRODUCTION

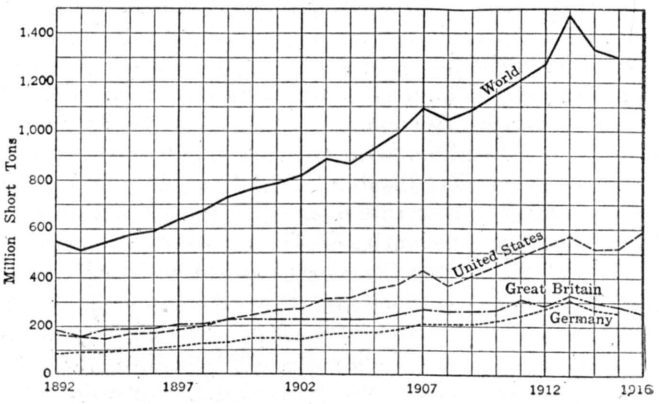

FIG. 2—COAL PRODUCTION

last year will, however, partly eliminate this discrepancy in value, and will reduce the deficiency in value from 50 to about 35 per cent. The United States started with a lead of 50 per cent over Mexico, the holder of second place, and ended with a production about double that of Mexico; but from 1902 to 1912 the Mexican production considerably exceeded that of the United States. The latter has shown an increase of about one-eighth, while Mexico has suffered such a decline as not only to wipe out the heavy lead with which she had held first place for 10 years, but has even pulled her considerably below her production of 25 years ago. Formerly Bolivia held third place, and Australia fourth. Mexico's position in second place is now being threatened by Canada, which formerly was far down the list, while Peru holds fourth place, and Australia has dropped behind Japan and Spain.

The production of iron ore in the United States now is about four times the production of a quarter of a century ago, and the pig-iron production has increased

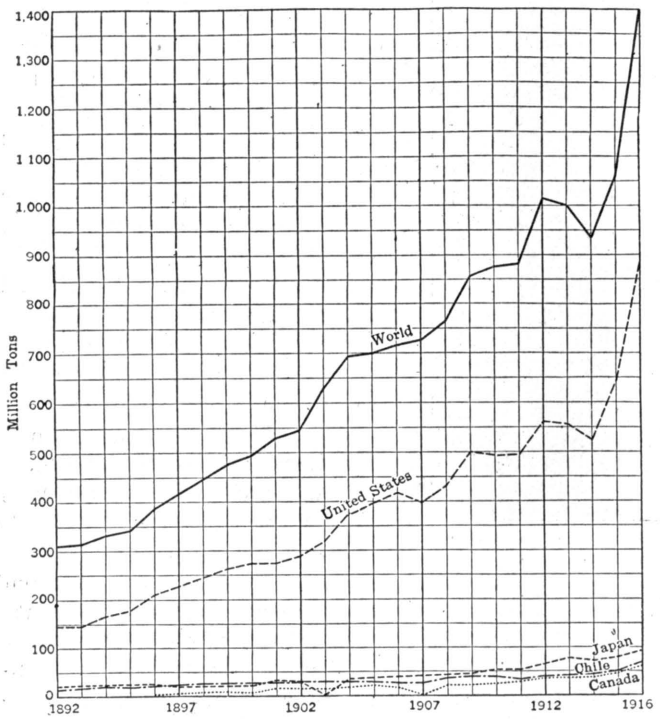

FIG. 3—COPPER PRODUCTION

in about the same ratio, while the pig-iron production of the world has increased to about three times its former amount. The order of producers is now United States, Germany, Great Britain, France, and Russia, with Austria-Hungary and Belgium practically tied for last place in the list of producers of more than 1,000,000 tons per year. The previous ranking was United States, Great Britain, Germany, France, Austria-Hungary, Russia and Belgium, with the last three all below the million-ton mark. Pig-iron production in the United States to-day is at a rate approximately a third greater than that for the entire world 25 years ago. It is true that the United States was in the lead in production then, but Great Britain was a close second, and the German production was over 50 per cent of the United States production. To-day the United States production is approximately 50 per cent of the world's production, or, in other words, is equal to that of all the rest of the world put together.

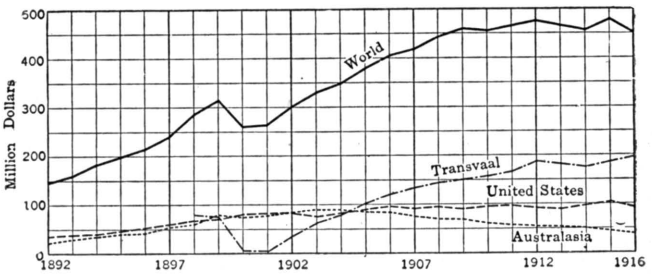

FIG. 4—GOLD PRODUCTION

The steel production naturally follows closely the production of pig-iron, and the order of production for the various countries is the same for steel as for pig iron, both at the beginning and end of the period under review. Due, however, to the development of processes which permit the use of greater proportions of scrap and waste material in the manufacture of the steel, and to the development of processes with higher percentage yields of finished steel on the raw material used, the total production of steel has grown faster than that of pig iron, and is now over five times what it was 25 years ago. And where the United States produced only a little over one-fourth of the former total, it now produces half, and the production of the United States has increased eight-fold.

During this period the processes used in the manufacture of steel have undergone a remarkable transformation. In 1892 almost 84 per cent of the steel production of the United States was made in the Bessemer converter, and 14 per cent in the open-hearth furnace. The corresponding proportions to-day are 26 per cent in the converter and 74 per cent in the open-hearth.

Lead production in the world during the past 25 years has approximately doubled. The ranking of producers at present is: United States, Spain, Germany, Australia and Mexico, all normally producing over 100,000 tons annually, but this figure has not been reached in Mexico during the last few years on account of the curtailment of production due to revolutionary activities. The former order of producers was the same as at present, except that Mexico was ahead of Australia. The heaviest increase was in the United States, amounting to about 260 per cent.

The enormous developments in the steel industry have demanded a proportionate increase in manganese production. The world's production is now about seven or eight times what it was 25 years ago, and there are

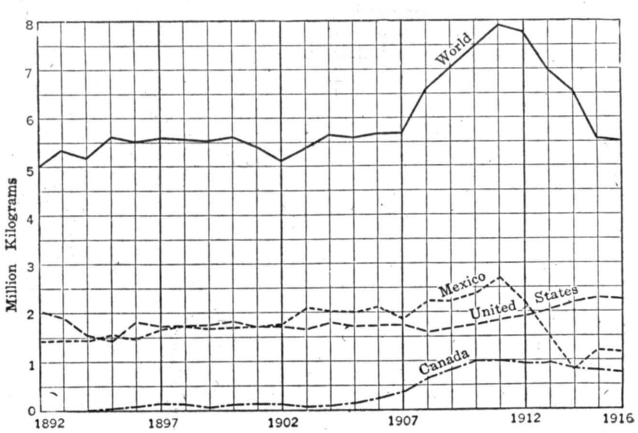

FIG. 5—SILVER PRODUCTION

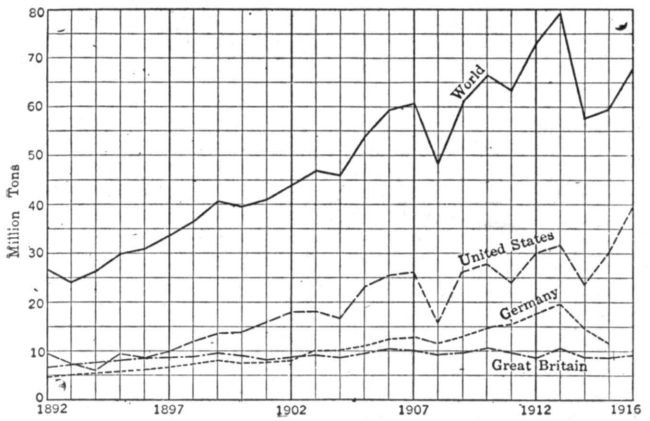

FIG. 6—PIG-IRON PRODUCTION

now three countries, India, Russia and the United States, with productions ranging from two to three times the world's production of 25 years ago.

The petroleum production of the world during the period has increased five-fold. In 1892 the producers showing more than 1,000,000 bbl. per year were the United States and Russia, together accounting for 97 per cent of the world's production. The present producers of more than 1,000,000 bbl. per year are, in order of production, United States, Russia, Mexico, Dutch East Indies, Roumania, Galicia, India, Peru, and Japan. The United States now contributes 64 per cent of the world's production, as against 57 per cent 25 years ago, and now stands at about six times its former production. The Dutch East Indies, Peru, Argentina, Trinidad, Mexico and Egypt have entered the field as large producers during the period and now account for one-eighth of the total production.

The world's sulphur production is obtained almost entirely from Italy and the United States, with smaller amounts from Japan and Spain. Twenty-five years ago Italy was the producer of over 90 per cent of the world's supply, with most of the remainder coming from Japan. Consumption was on the increase, and the Italian production grew rapidly, reaching a maximum in 1905, when the production was nearly double that of 1892. Production in quantity in the United States began in 1903 and this soon reacted on the Italian production, which declined to about 50 per cent of the total.

Sulphur production during the 25 years has doubled, but pyrite production has more than trebled. Formerly France led in production, followed by Portugal, Germany, United States and Spain, all producing over 100,000 tons annually. The producers of that quantity

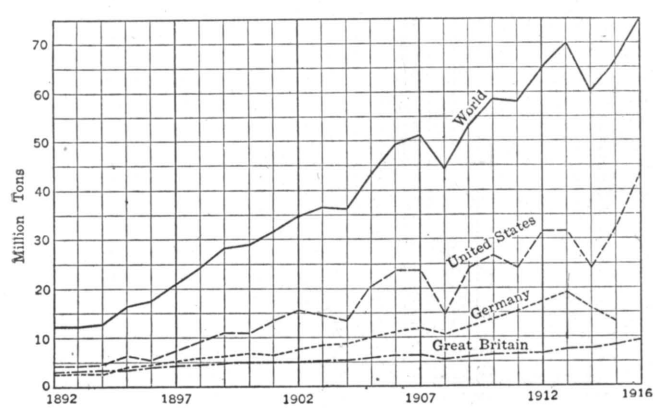

FIG. 7—STEEL PRODUCTION

at present are as follows: Spain, Norway, Portugal, United States, Italy, France, Germany, Canada, Russia, Japan and Hungary. Of all, Spain has shown the greatest increase, with Norway second. The Spanish production has jumped from 10 per cent of the total to nearly 25 per cent, and the Norwegian from 6 per cent to double that proportion. The United States production has just about kept pace with the total production.

The tin production of the world has, in the quarter of a century, almost doubled. Malaya still contributes a large share of the total, but has dropped from over 50 per cent almost to 40 per cent. England long held second place, but now Bolivia takes it with almost 20 per cent of the total, where formerly she was at the end of the list with 3 per cent. Banka still retains third place, having increased somewhat more rapidly than the totals. Australia and Billiton have both declined, the former the more seriously.

Tungsten is a metal that has seen almost its entire commercial growth within the period under review, and most of that within the last few years. The production of tungsten ores in this time has increased in a ratio of almost 50 to 1, two-thirds of which has been within the last five years. In the present production the United States accounts for 35 per cent of the total, Burma 22 per cent, Portugal 8 per cent, Australia 7 per cent, and Japan 6 per cent, all producing over 1000 tons annually.

Zinc production in the past 25 years has about trebled. Most of the leading zinc producing countries have been disturbed by the war to such an extent that recent figures are not available for comparison, but from the latest data available the United States was

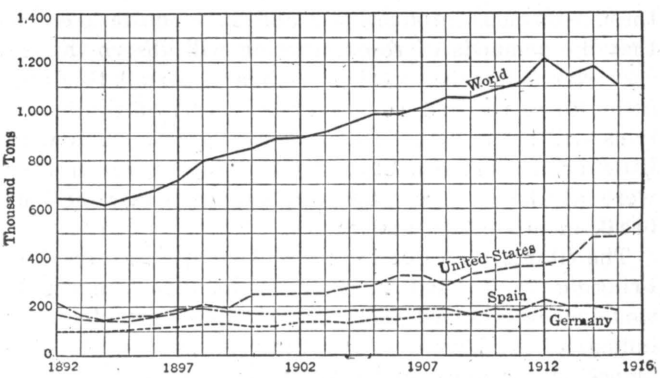

FIG. 8—LEAD PRODUCTION

the leading producer with Germany second, Belgium third, France fourth and Great Britain fifth. The former order was Germany, Belgium, United States, Great Britain, France. The United States has increased its production to eight times its former amount, and has increased its proportion of the world's output from 20 per cent to about 60 per cent.

It is of course absolutely impossible to make anything like a direct comparison between conditions now and twenty-five years ago, because now everything is on an abnormal basis. Some industries are swelled to beyond all semblance of their normal proportions by the extraordinary demands of war, while others are severely handicapped because of the disturbance of raw materials and markets, and the serious difficulties encountered in shipping, difficulties which are not by any means confined to trade with belligerent countries, but

extend also to the neutral countries and, in a large measure, to purely domestic shipping as well. However, in spite of all of the necessary readjustments, the period of the war has been, to most of the mineral and metallurgical industries, one of unparalleled prosperity. This is particularly true with aluminium, copper, iron and steel, tungsten, and zinc, which on this account have come to be classed under the heading of "war metals."

FUTURE DEVELOPMENTS AND INTERNATIONAL RELATIONS

What is in store for the future is difficult to foresee, but whatever may be the eventual outcome of the present conflict, it seems certain that the mineral and metallurgical industries will be called on to continue production to their utmost capacities in the work of restoration, and this will extend over a period of several years. It is to be expected that there will be somewhat of a slackening in speed after the conclusion of the war, for, however pressing may be her needs, Peace can never be the exacting taskmaster that War is; this slackening will be simply a logical outcome of the conditions, but it should not be of such proportions as to cause a serious slump in any industry as soon as the war demands are satisfied. On the contrary, manufacturing plants will be able to relax from the strain of war production and settle down to the fulfillment of the demands of peace and reconstruction at practically their normal capacity at the time. Of course it is not going to be possible after the war to keep the production curves of the various materials rising at the precipitous angle they have assumed during the war, for demand in many lines now is far above normal and is still increasing, but the normal course of the world's progress will soon bring it to a point where it can absorb these enormous productions, and it is quite possible that the demands of reconstruction will absorb the excess over a sufficient period of time to permit this condition to be realized, so that at the worst all the industries will suffer will be a period of a few years with little or no increase beyond the point at which they were at the close of the war, rather than a serious break in production and values.

The titanic forces of the present struggle are rapidly bringing to a head many conditions that normally would have required years of slow development. New industries are born over night and grow to a real semblance of maturity in weeks instead of years. Plant productions increase by leaps and bounds, doubling and trebling within the year under the impetus of an all-absorbing demand and an unprecedented price. New machinery and processes are developed and invention is stimulated in all branches of industry.

Since the opening of the European war the latter part of July, 1914, with its accompanying commercial

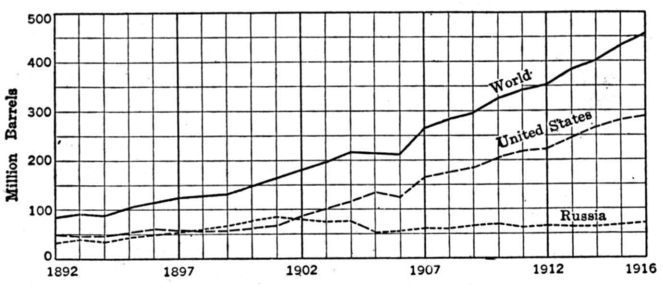

FIG. 9—PETROLEUM PRODUCTION

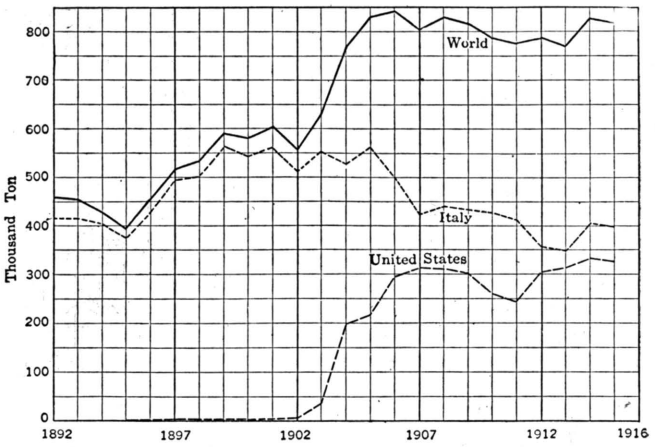

FIG. 10—SULPHUR PRODUCTION

disturbances, there has been a great deal of discussion in this country concerning the possibility of making the United States independent of foreign supplies in order to avoid future difficulties of this kind. This, of course, does not mean that all imports are to be discontinued, but that attempts be made to furnish domestic supplies of basic materials, in order that a whole industry may not be handicapped by the lack of some one material on which the process of manufacture depends. On analysis, however, this proposition does not prove to be as simple as it seems on the surface, particularly with regard to the mineral industry, either for the United States or for any other country. And, naturally, the smaller the country concerned and the more limited her resources, the more remote does any such possibility become. The discussion as here outlined is from the particular standpoint of the United States, but the arguments apply equally well, in a general way, to any of the other large mineral producing countries.

It follows from the natural course of human life and its needs that certain industries should be fundamental, and others secondary—or, in other words, that certain basic industries are concerned with the supplying of the prime necessities of life in their crudest forms, while the other industries are concerned with the modification of these crude forms through various stages of higher refinement, or with modifications of form, location, etc. Of these basic industries, probably none is more widely scattered over the face of the earth, more closely related to the general welfare and progress of the countries concerned and, in fact, more thoroughly universal than the mineral industry, with the

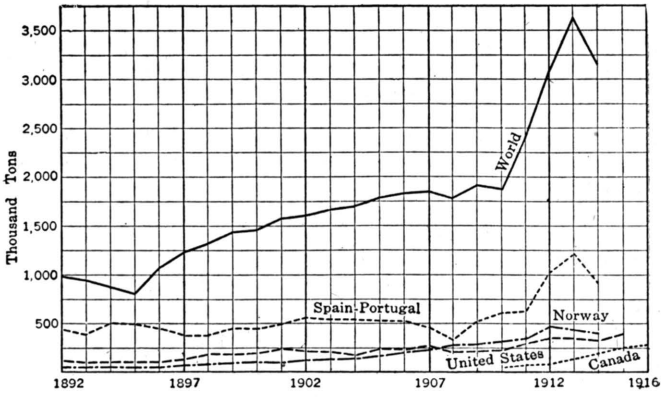

FIG. 11—PYRITE PRODUCTION

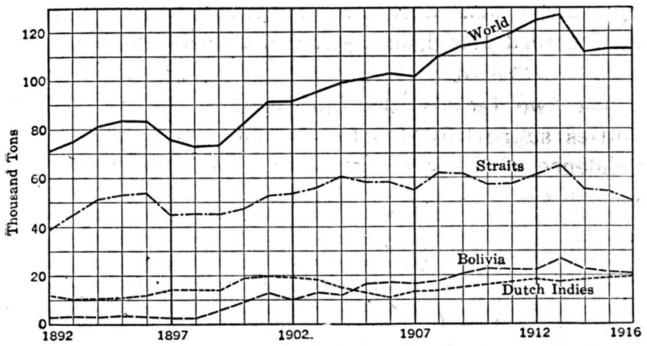

FIG. 12—TIN PRODUCTION

single exception of agriculture. In no other industry is the influence of a single locality so widely felt as in the mineral industry. For years the world went to Ceylon for its graphite, to Sicily for its sulphur, to the Ural Mountains for its platinum. A small district in the State of Arkansas furnishes the raw material for 65 per cent of the world's supply of aluminium. Chile furnishes practically the entire world's supply of sodium nitrate and Germany has supplied such a large proportion of the world's supply of potash, that the limitations of production and exportation resulting from the disturbances of war have made a shortage of this most necessary material throughout almost the entire world. And carrying things to the opposite extreme, it requires almost a page to list the countries that produce important quantities of the ores of gold, silver, copper or iron.

Probably every country and every state on the face of the globe has within its borders valuable mineral resources of one kind or another, of greater or less importance. In many cases it is something that is merely of local interest and importance; in other cases, such as those mentioned above, the materials are of international importance. Dana classes ice as a mineral, but its use purely as a mineral substance is probably limited to its employment as a building material in the arctic regions. Southern Indiana's Bedford limestone and Vermont's granite, however, while used for the same purpose, are naturally of incomparably wider application and value. When the production and use of any material is purely a matter of local interest, any knowledge or information concerning the industry involved in the production is also merely of local interest. But just as the breadth of the market and the scope of application of any material increases, so does the demand for information in regard to that material increase. The more general is the demand for the material itself, the more general is the demand for knowledge concerning the progress of the industries producing this same material in other localities, and on this demand for knowledge there can be placed no final limitation except one of degree. Other factors, geographical or political, economic or social, are contributive, rather than determinative.

The Arizona copper producer is interested more in the Montana production than in that of Utah, not because it comes from Montana, but because it is a heavier competitor in his market; but should the Utah production exceed that of Montana, Arizona's interest would follow the heavier producer, rather than remain in a given locality. Europe is interested in the Chilean copper developments, not because they are in Chile, but because they promise an additional amount of metal available for import into Europe, and the interest would be just as great if the deposits were in Fiji or Greenland.

As Kipling says, "The Colonel's lady and Julia O'Grady are sisters under skin." The laborer, the superintendent, the general manager, the New York capitalist, all have the same general interest, differing only in intensity and extent, depending on the contributing factors. The laborer makes his living from his work in the mines or smelter, and wants to know how things compare in the mine where he works and in the other mines in the neighborhood. The superintendent compares conditions in his own working district with the adjoining districts. The general manager in charge of plants in different parts of the country will consider matters on a still broader scope, and the capitalist will compare his holdings in this country with those in other countries. And so we have in every case, from whatever angle the question may be considered, an interest proportioned to the extent to which the individual is affected by the conditions within his own particular field of operations, as compared with other fields of similar work.

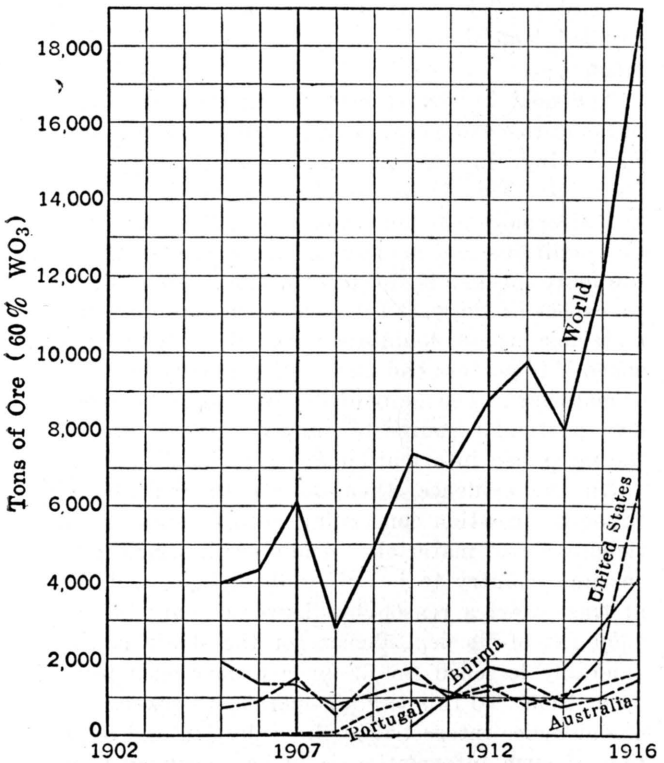

FIG. 13—TUNGSTEN PRODUCTION

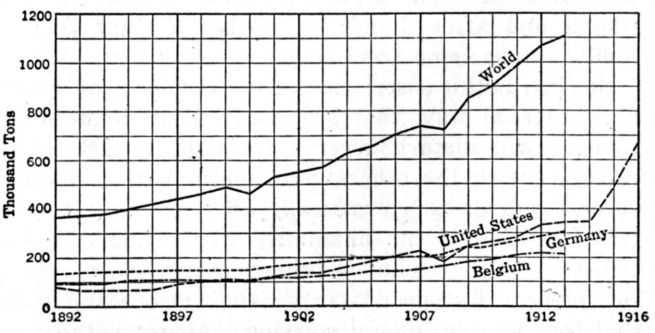

FIG. 14—ZINC PRODUCTION

The general interest thus manifested and the demand thus created for knowledge of the progress of an industry in different localities is inseparably linked with the economic dependence of each country of the world on most of the other countries. That stage of civilization when the world was made up of a number of independent districts is long past. A given locality can no longer produce within its own confines everything that is demanded in the course of its life. In the first place, civilization has reached a point where it demands more than it has in the past, and in the second place, economic development and the law of the survival of the fittest has led to an age of constantly increasing specialization, which, aided by increasing ease of communication and transportation, has brought things to a point where we now find ourselves dependent for one thing or another on almost every district of the civilized world.

This dependence can be well illustrated as the average man looks around his own home. He no longer lives in a house of his own building, eats food of his own growing, cooked in vessels of his own making, and wears clothes of his own weaving. In the average man's house we now see aluminium which probably originated in Arkansas, or possibly in France, and which, in the course of manufacture demanded cryolite from Greenland. He reads a newspaper printed from type containing lead from Missouri, Idaho, Utah or Mexico, and antimony from China. The asbestos pads on the kitchen stove came from Canada, and the polish on the stove from Korea, or possibly from Ceylon or Madagascar. The street in front of the house is paved with asphalt from Trinidad. The house is painted with barium from Germany. He frequently uses as a medicine iodine from Chile and bismuth from Bolivia. Such steel as he uses comes mostly from the United States, but the furnace in which it was made required magnesite from Austria or Greece, and as the steel came from the furnace it was deoxidized with manganese from Russia, India or Brazil. To make his stove bright and cheerful it is given windows which are glazed with mica from Canada or India. He gets his light at night from gas mantles made from monazite from Brazil or from electric globes, the tungsten filaments of which may have originated in the United States, but which are just as likely to have come from Burma or Bolivia. He uses nickel from Canada and tin from Bolivia or Malaya. He fertilizes his lawn and garden with nitrate from Chile and potash from Germany. His wife cherishes an engagement ring bearing a tiny diamond from South Africa, set in platinum from Russia, and dreams of some time having a necklace of "real pearls" from the South Sea Islands. They eat off china from Germany, with silverware that might have come from almost anywhere, and after dinner he smokes a cigar that he fondly thinks came from Havana.

So close is this association of the various countries in a commercial way, that any factor that disturbs one country will disturb several, through its commercial relations with the others, and anything that disturbs several will disturb practically all. An indication of this condition is the unanimity with which the contributors to the technical press mention the effects of the present European war on the various industries that they happen to be discussing. Almost without exception, these industries have been considerably affected by the war. Some have been stimulated and some have been retarded and disorganized, but very few have remained unaffected.

These two factors, the individual interest in other localities supporting a given industry, and the interdependence of the various countries on each other for adequate supplies of certain materials, make necessary the dissemination of general information in regard to the status of the various industries from time to time. There are in the various states and countries certain organized agencies for the collection and distribution of such information, and the technical press gives a large amount of general information along these lines. But there is still room for considerable expansion along this line. Information should be fuller and more detailed, and should be made available more promptly.

It is not to be expected with the present broad development of all the various industries that any country of importance can become entirely independent of others in the matter of mineral production. It is possible to become partly so by the fullest development of the domestic resources, but absolute independence is impossible, because no one country, not even the United States nor Great Britain, with all her colonial possessions, includes within its boundaries *all* of the almost infinite varieties of mineral products that are now demanded by our every-day life.

PERSONAL CO-OPERATION

The prime requirement for the best development of domestic resources is a thorough knowledge of those resources. And for the best results, this knowledge must be well disseminated and not be confined to a few people in the immediate locality. In other words, every available source of material should be thoroughly advertised—not necessarily by paid advertising—but by proper publicity in the technical press, in order that the information may be readily available to all who are interested. This condition is at present only partly fulfilled, and there is room for considerable improvement.

And next in importance after a thorough knowledge of domestic conditions, is an equally thorough knowledge concerning the various foreign sources of any given material. This is, of course, more difficult to secure, and information is not nearly so plentiful as for domestic conditions and usually the more remote the locality the more meager is the information. Many of the disturbances of the past three years in foreign supplies of materials would doubtless have been considerably lessened if importers had had a fuller knowledge of sources of materials. Too many had no information beyond their own particular source of supply. And in many cases the necessary information was very hard to secure.

All the evidence, then, points to the necessity of fuller information concerning both foreign and domestic supplies of materials. And since it seems impossible for any country to be minerally independent, let each at least exert a reasonable degree of care in the apportionment of its dependence, for the strain can be considerably lessened for all by a proper exchange of information. To this end, co-operation between the various agencies interested in the collection and dissemination of such information is to be encouraged and fostered to the utmost possible degree.